



An innovative ecological intensification project
for society and the planet

Sophie Carton
Climate KIC Contextual Learning Journey – July 2010





Grignon Energy Positive project at AgroParisTech experimental farm

- Introduction to Grignon Energie Positive programme
- Assessing Grignon farm's fossil fuel consumptions and GHG emissions
- Measuring Grignon farm's fossil fuel consumptions and GHG emissions
- Reducing Grignon farm's fossil fuel consumptions and GHG emissions
- Informing and educating the professionals, the general public and the future generation





INTRODUCTION TO GRIGNON ENERGIE POSITIVE PROGRAMME



Origins of the project



Danger CO₂W

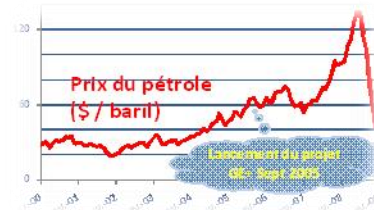


Image in the society

Oil price/scarcity



Feeding the world

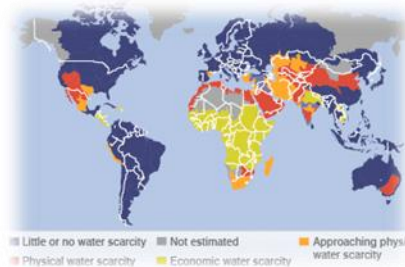
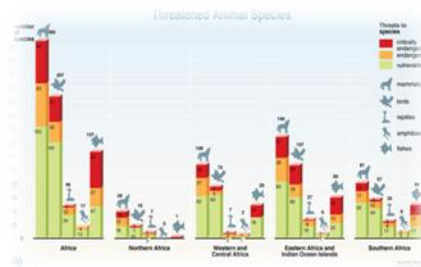
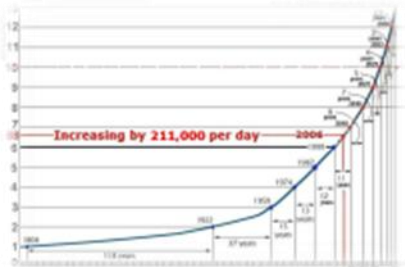
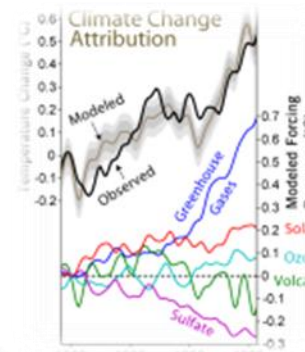
**Agriculture at the
crossroads of many
challenges**

Climate change

Water scarcity

Demographic explosion

Biodiversity loss





Main focuses



Pr. Olivier Lapierre, professor at AgroParisTech and director of Céréopa

The environmental challenge

Positive communication and civic education



Scientific and institutional environment



AgroParisTech
Céréopa
Inra system



Grignon
experimental
farm



Public and
private
partners



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"La mission de l'humanité, c'est de transformer
l'énergie solaire en conscience"
Patrick Viveret





Grignon experimental farm

CROPS

550 hectares split in 3 main parts
(Grignon, Bois-d'Arcy & Palaiseau)

- Cereals: 275 ha
- Maize: 82 ha
- Rapeseed: 30 ha
- Grassland and fodder crops: 148 ha
- Fallow: 12 ha
- Energetic crops: 3 ha



LIVESTOCK

- 120 dairy cows (1.2 million liters quota)
- 500 ewes (meat and breeding)



PROCESSING & CONDITIONING

500 000 L of processed milk
(yogurts, bottled milk and cheese)



DIRECT SELLING



EDUCATION





An educational tool for the general public and AgroParisTech engineer students



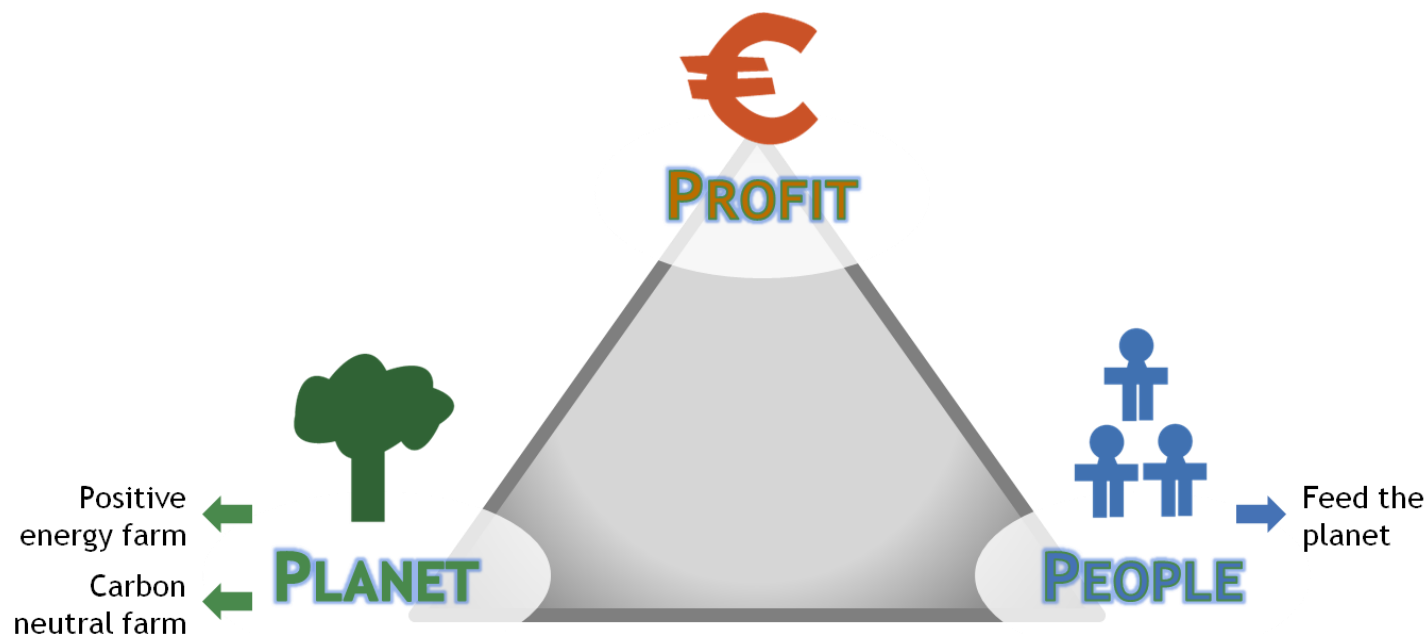


ASSESSING GRIGNON FARM'S GHG EMISSIONS AND FOSSIL FUEL CONSUMPTIONS



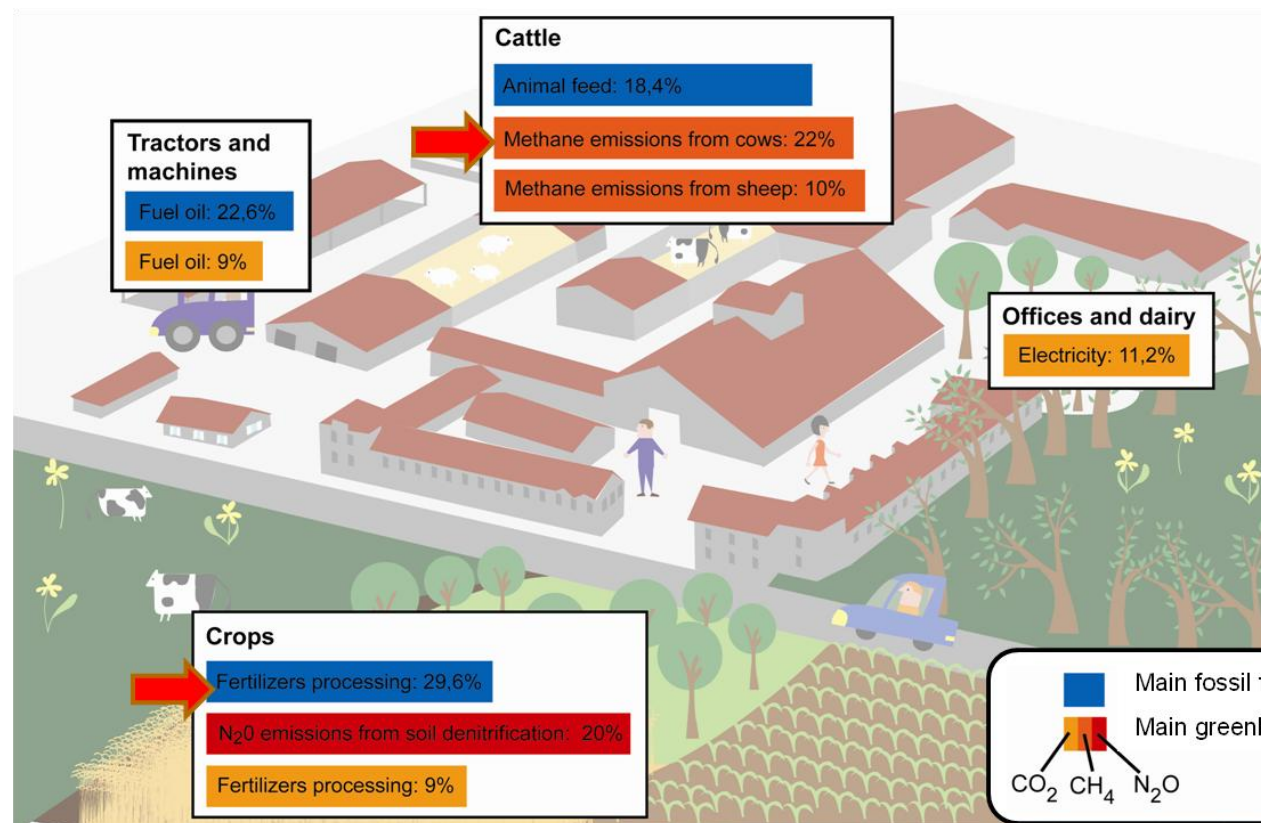


The project's values : the 3 P's





First environmental assessment in 2005



Fossil fuel consumption:

17 000 GJ (408 tep)

Equivalent to **100 persons.**

GHG emission:

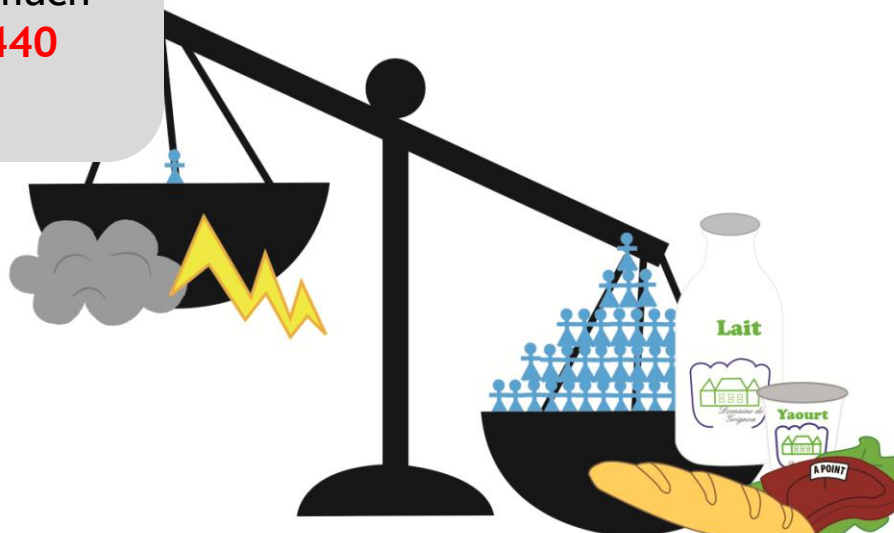
2 600 t eq CO₂

Equivalent to **440 persons.**



Results that need to be kept into perspective

Grignon farm consumes as much fossil fuel as **100** people and emits as much greenhouse gas as **440** people...

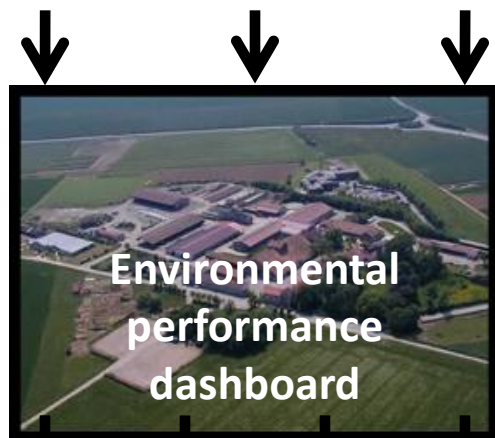


... But it can feed between **7500** and **9500** people.

■ The environmental performance dashboard:

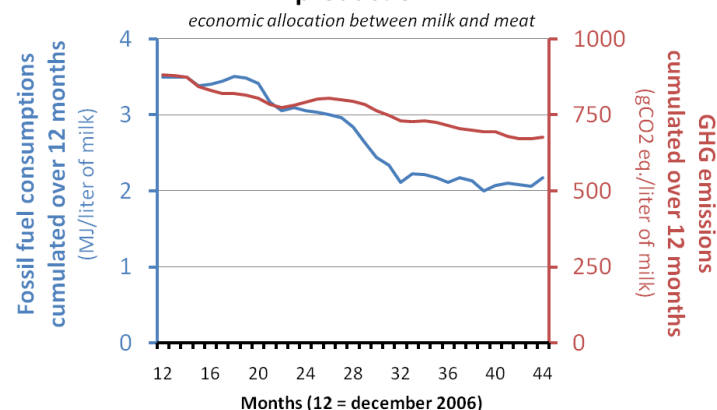
Our environmental accounting tool

Impact coefficients Material and energy flows Information on cropping systems



Evolution of performance indicators

Evolution of energy and GHG performance of milk production

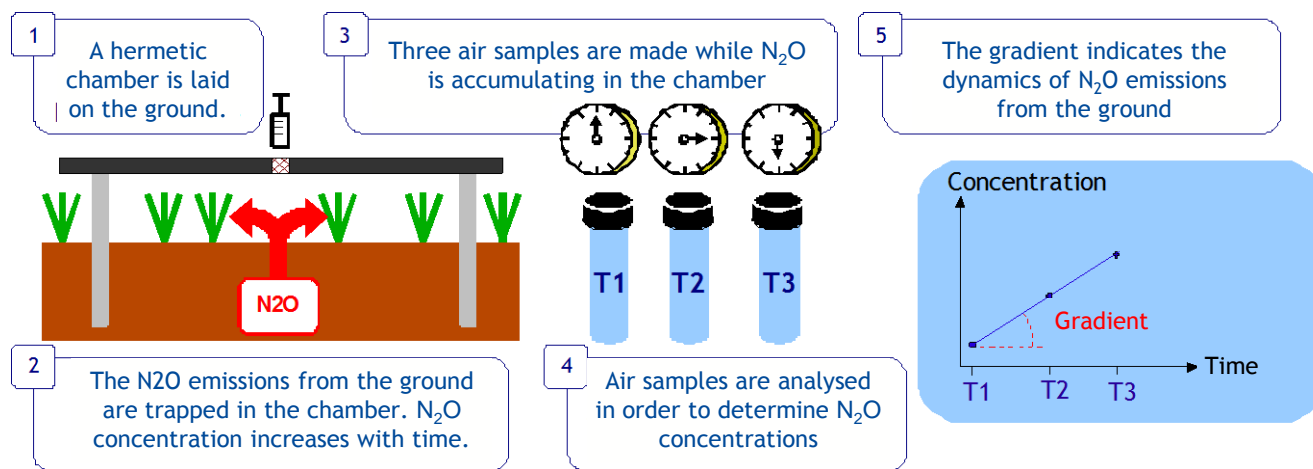


- 1 Detection of levers for improvement of agricultural and processing activities
- 2 Critical examination of impact coefficients
- 3 Adaptability to other farms



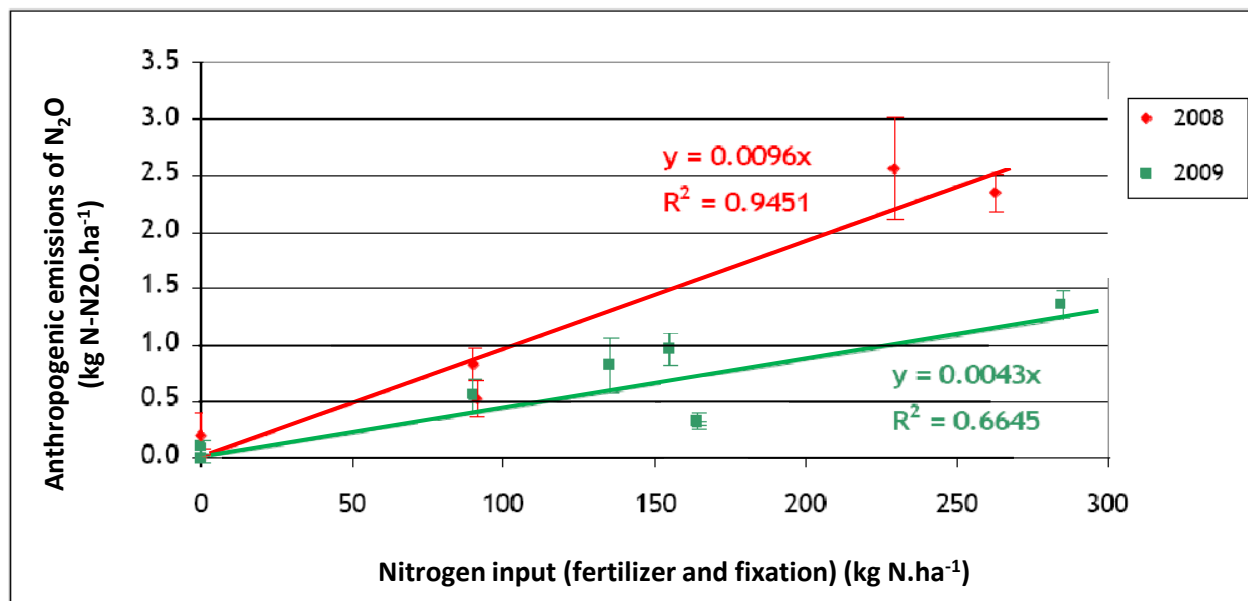
MEASURING GRIGNON FARM'S GHG EMISSIONS AND FOSSIL FUEL CONSUMPTIONS

Measurement of nitrous oxide emissions from crops



- Better knowledge and understanding of crops' impacts on climate
- Ability to test impacts of different technical itineraries on N₂O emissions
- Contribution to and questioning of existing references on N₂O emissions from crops

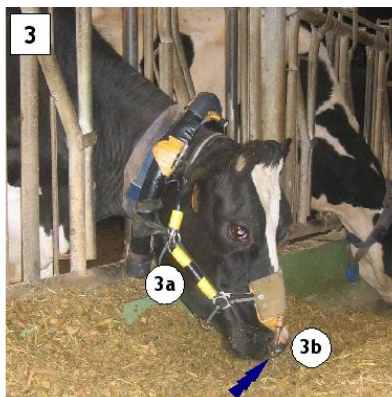
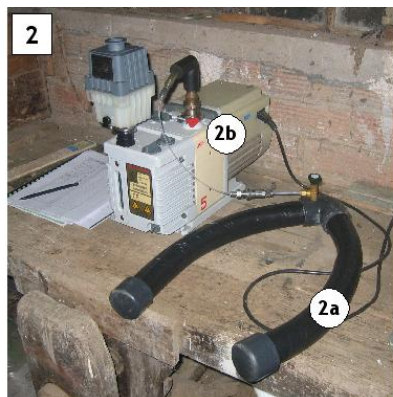
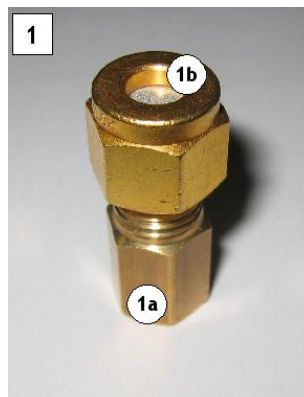
Follow-up of N₂O emissions from crops: results



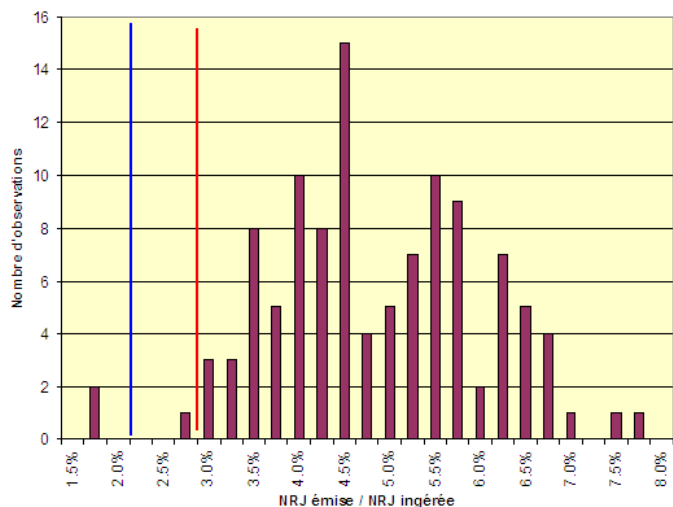
- Important interannual variations of emission coefficients



Measurement of cows' enteric methane emissions



1. SF6 capsule
2. PVC evacuated tube
3. Capillary tube reaching the cow's nostrils



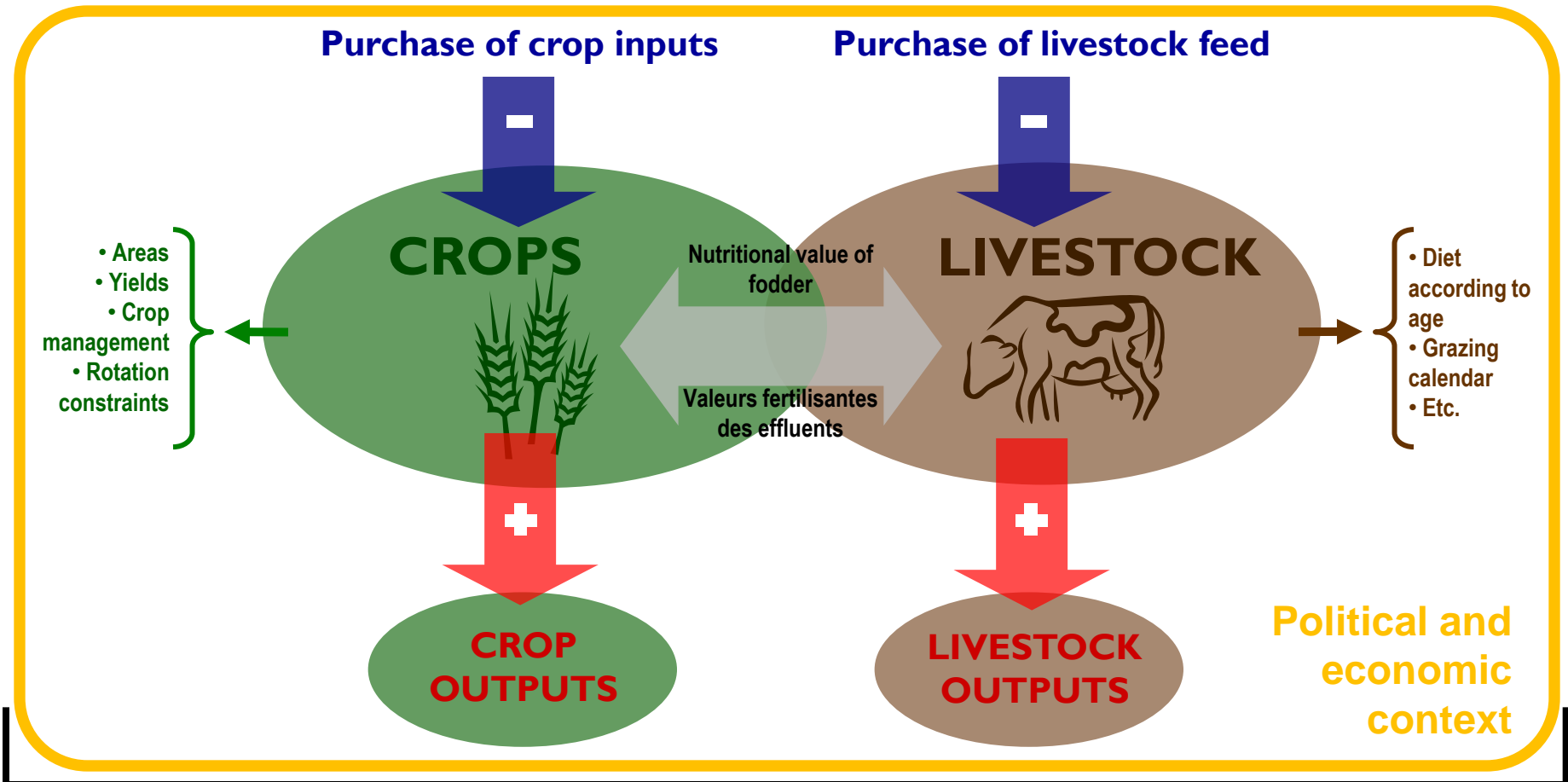
- 1 Better understanding of mechanisms underlying enteric methane emission
- 2 Ability to test the impacts of different diets on CH₄ emissions
- 3 Contribution to and questioning of existing references



REDUCING GRIGNON FARM'S GHG EMISSIONS AND FOSSIL FUEL CONSUMPTIONS



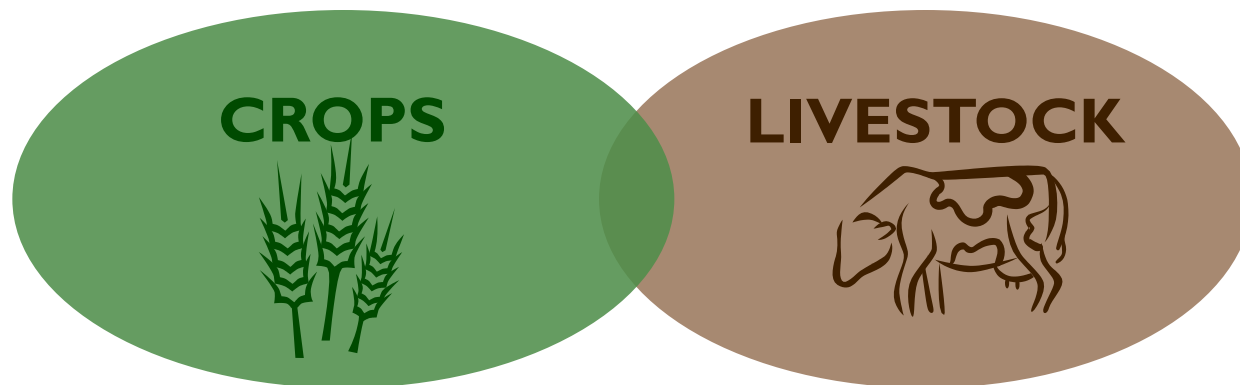
PerfAgroP3: an optimization tool designed to test progress pathways



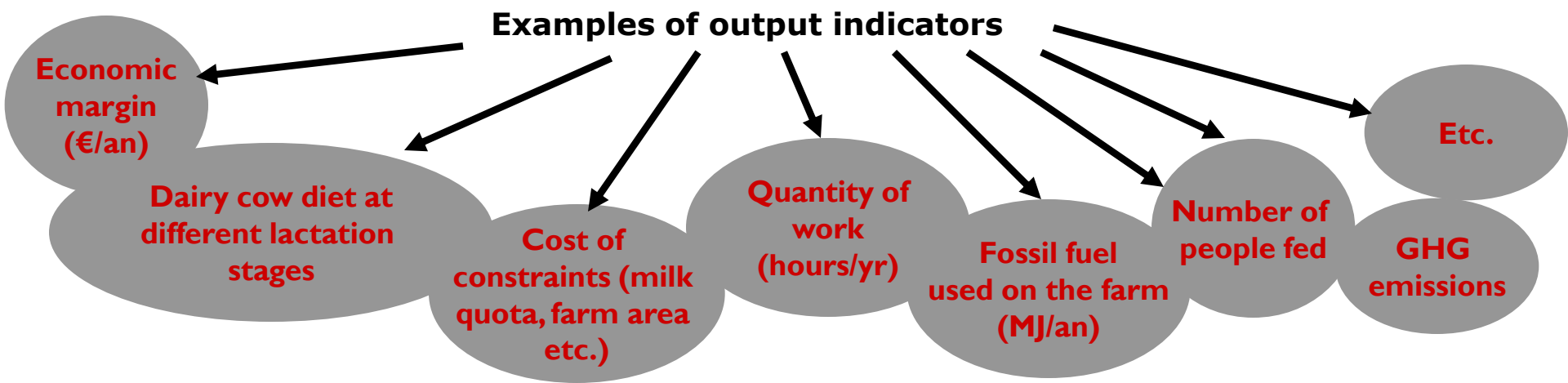
GLOBAL PERFORMANCE
of the system described into details



PerfAgroP3 performance indicators: back to the 3 P's



GLOBAL PERFORMANCE of the system described into details





Adaptations of the production system



Maintenance of a **high production level**

More grazing for **non productive cows** (dry cows and heifers)



Increase in cattle feed **energetic density** (e.g. with rape cake)



Minimal **soil work** whenever possible

Increase in share of **legumes** in crop rotation



Cereal chaff harvest

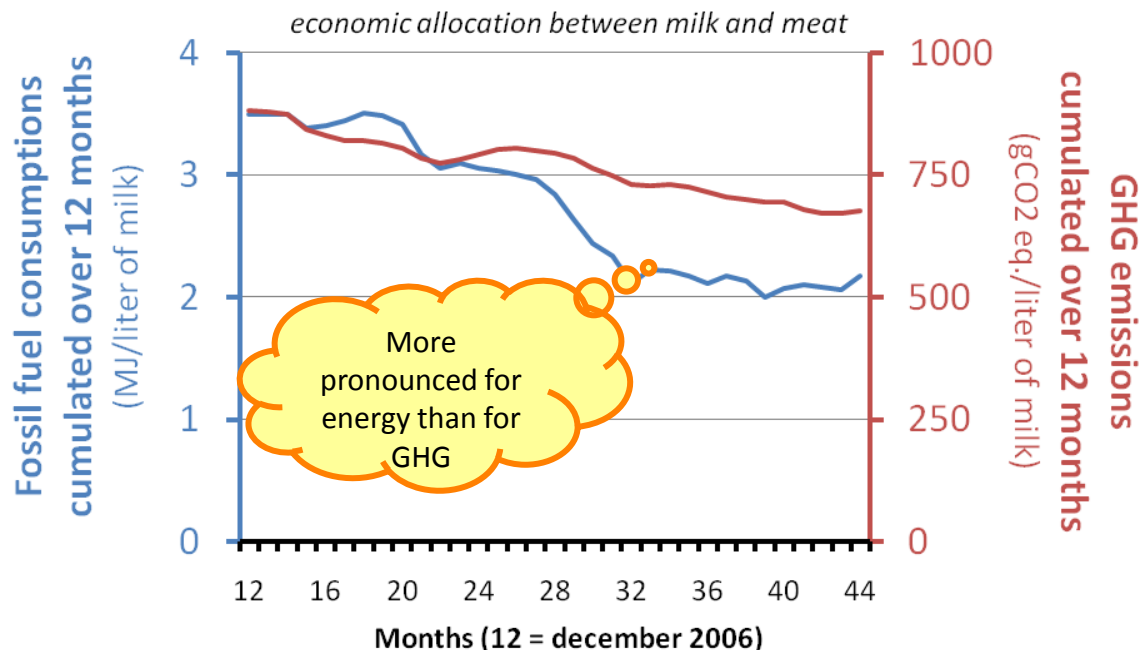


Test of **energetic crops** on 3 ha (switchgrass & miscanthus)



A significant improvement in milk production

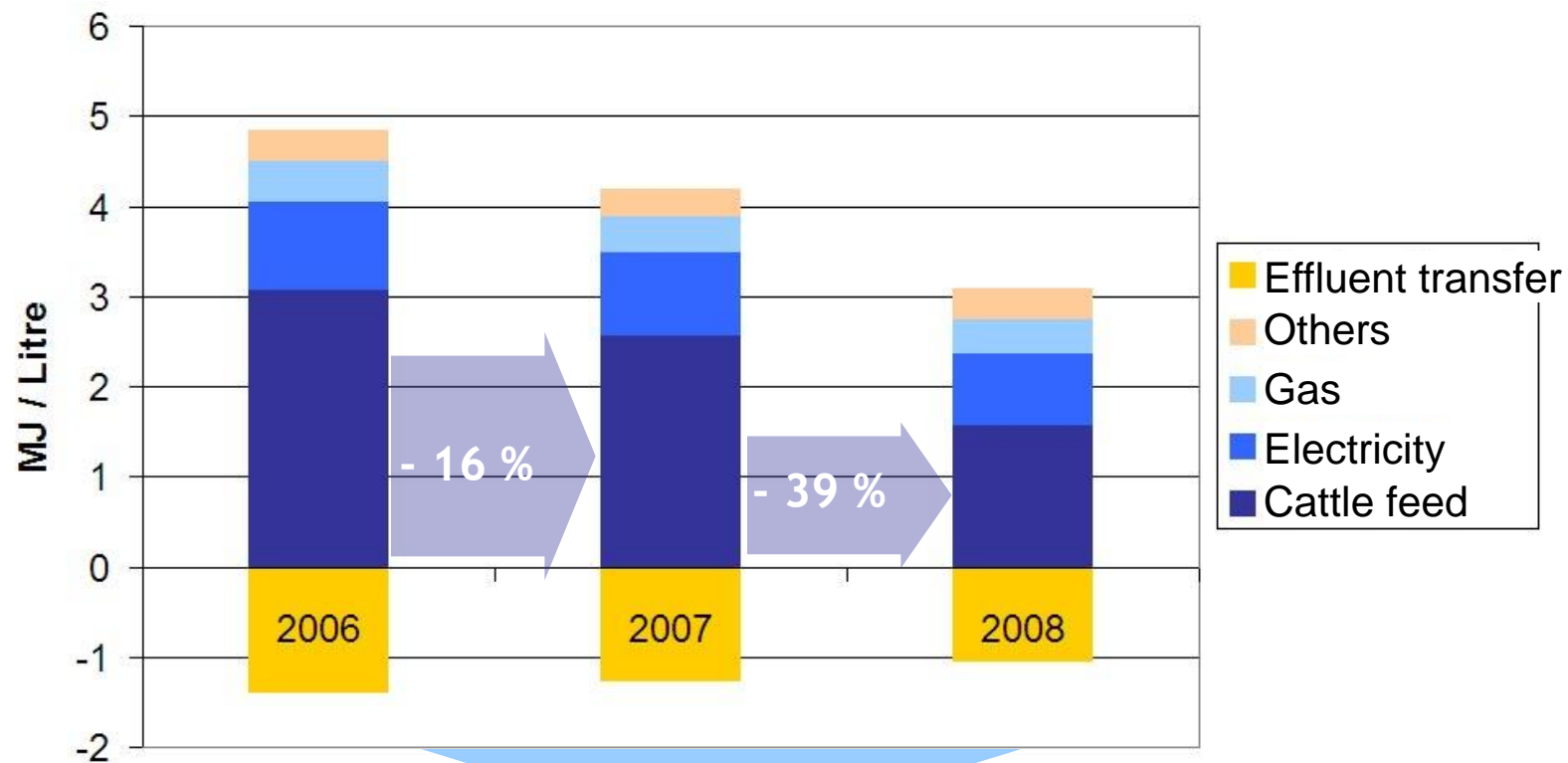
Evolution of energy and GHG performance of milk production



- 40% fossil fuel consumption (per liter of milk)
- 20% greenhouse gas emissions (per liter of milk)



Improvement lever of milk energetic performance

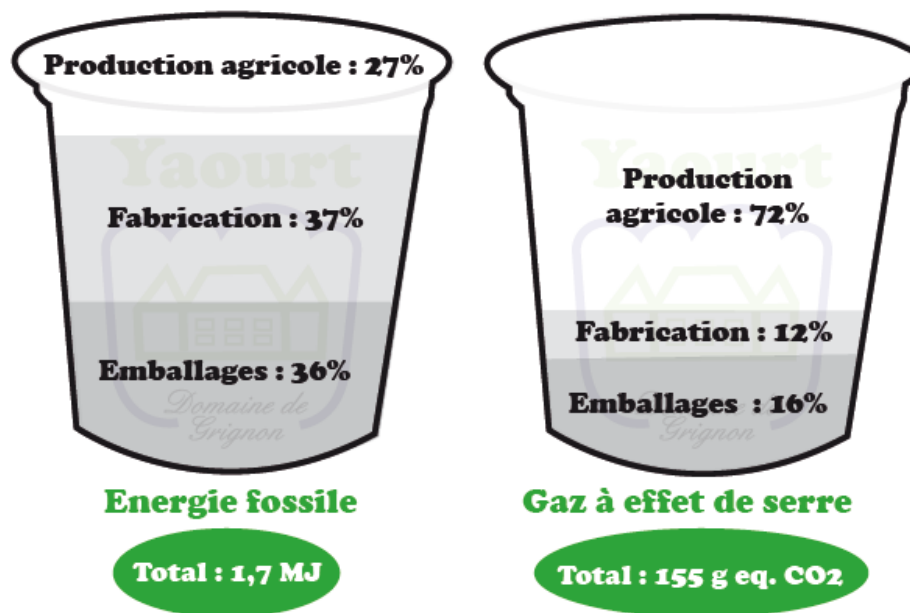


Cattle feed is the strongest lever



Grignon yogurt's environmental profile

Le yaourt de Grignon et la planète

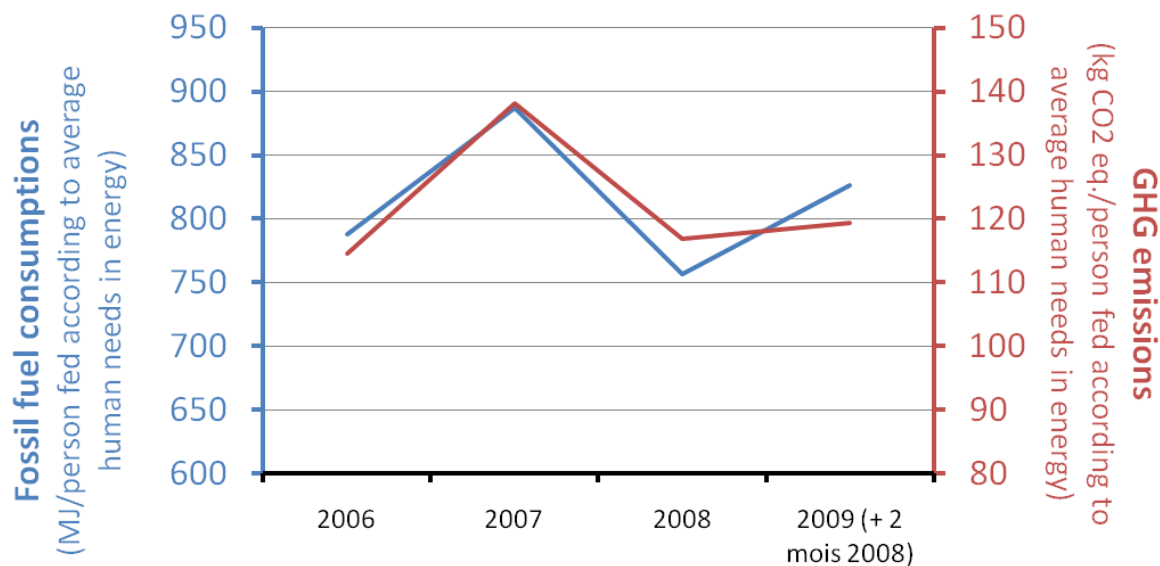


Consommations d'énergie et émissions de gaz à effet de serre liées à la production d'un yaourt de Grignon

N.B. : Calculs réalisés pour un yaourt entier pot plastique sortant de l'atelier de transformation laitière.

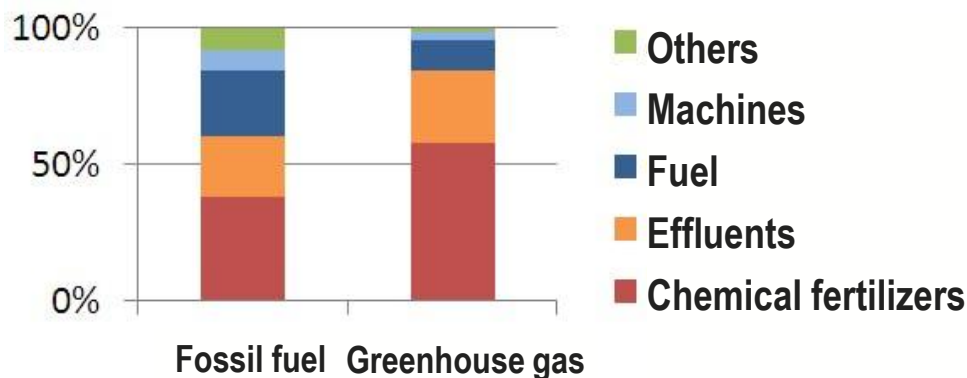
Mitigated results for crops

Evolution of energy and GHG performance of crops



- Increase in global GHG emissions and fossil fuel consumptions by nearly 30%
- Increase in number of people potentially fed ... not so bad in the end!
- High influence of climate ... difficult to control!

Environmental costs of crops



Structure of cash crops' environmental costs

- High impact of chemical fertilizers
 - Nitrogen balances
 - Organic fertilization wherever possible



Example of innovation: chaff harvest

- **Chaff harvest** : field weeding, facilitation of non-tilling practices, less herbicides and production of renewable energy if chaff is burnt in a biomass boiler.





Towards the positive energy farm and the carbon neutral yogurt?

- **Biomethanisation** unit with a capacity of **10 000 tons of waste** (half farm waste and half urban waste),
- **2 250 K€** investment
- **Energy production of 664 tep:** twice the farm's fossil fuel consumptions in 2008 (315 tep)
 - 3 051 MWh electricity (sold to EDF)
 - 2 350 MWh heat (2/3 consumed on the farm)
- « **Compensation** » of **1 760 tons CO2 eq.:** 81 % of the farm's emissions in 2008 (without taking into account the economy of fertilizers).





Beyond GHG and fossil fuel: biodiversity etc.

■ Biodiversity follow-up



Observation des oiseaux par la
LPO à Grignon, Mai 2009



Selected
indicators



Notation flore sur parcelle d'orge de
printemps par la FREDON, Mai 2009



Le demi-deuil (*Melanargia galathea*)
Grignon, juin 2009



Vanesse des chardons ou Belle-
Dame (*Cynthia cardui*)
Grignon, juillet 2009



Le Tristan (*Aphantopus
hyperantus*)
Grignon, juin 2009

- 1 Better understanding of the impact of our practices on biodiversity
- 2 Contribution to references on agricultural biodiversity
- 3 Testing and questioning of existing biodiversity indicators



INFORMING AND EDUCATING THE PROFESSIONALS, THE GENERAL PUBLIC AND THE FUTURE GENERATION



Agriculture in the hot seat



Danger CO₂W

Climate change is a real problem and airlines are partly responsible.

Air transport produces 2% of global CO₂ emissions, but this is actually less than the CO₂ produced worldwide by cattle.

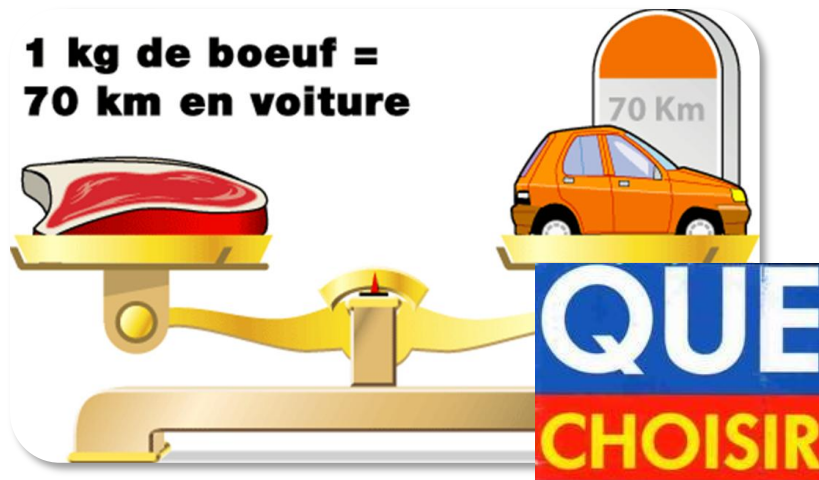
Nevertheless, we're working hard to limit the impact of air transport by developing more fuel-efficient aircraft and pushing for shorter flight times.



Flying's a wonderful thing

This advertisement is supported by Airbus, The Boeing Company, Pratt & Whitney and Rolls-Royce.

**1 kg de boeuf =
70 km en voiture**



Climate change is a real problem and airlines are partly responsible.

Air transport produces 2% of global CO₂ emissions. But it might surprise you to know that this is actually less than the CO₂ produced worldwide by cattle.



A new perspective on agriculture



Communicating positively towards the professionals



1

GE+ website (in english too!): 3 000 visitors/month + newsletter (1 200 subscribers)

2

Liflet, article and poster edition

3

Participation in workshops and seminars

4

Organisation of visits for professionals (farmers, firms in agribusiness...)



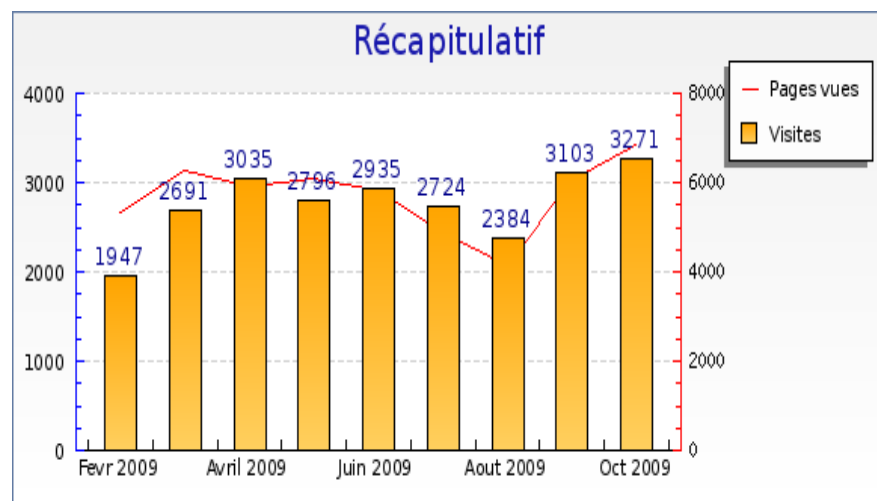
Educating the engineer students



1 The farm: a pedagogical tool to teach about agriculture

2 The project: a pedagogical tool to teach about environmental issues in agriculture

■ Technical and scientific watch database:



- 1 A real demand from the public (over 100 visits/day)
- 2 Used in the newsletter to inform about the latest news on GHG/energy
- 3 Used to inform the team
- 4 Helps to question our practices and find new solutions



Positive communication



- 1 Communication on intensive, high-performing « real agriculture »
- 2 Communication on environmental improvement pathways of agriculture
- 3 Communication on benefits that agricultural producers provide to society

- Creation of fun and pedagogical activities and games



■ Creation of an educative website

<http://www.agroparistech.fr/assietteplanete/>



1 Original and pertinent positioning : from the plate to the planet (nutrition & climate)

2 Downloadable teaching aids

3 Positive communication!



For more information...

<http://www.agroparistech.fr/energiepositive>

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